STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

BEM1034 – MATHEMATICS FOR ECONOMICS
(All sections / Groups)

31 MAY 2019
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FOUR (4)** printed pages excluding cover page.

2. Answer **ALL FOUR (4)** questions.

3. Please write all your answers in the Answer Booklet provided.

4. Selected mathematical formula are provided at the end of the question paper.

QUESTION 1 (25 MARKS)

(a)   Solve $5 + (3)4^{x-1} = 12$

(6 marks)

(b)   Find x if $(25)^{x+2} = 5^{3x-4}$

(4 marks)

(c)   The projected population P of a city is given by:

$$P = 100,000e^{0.05t}$$

where t is the number of years after 1990. Predict the population for the year 2010.

(2 marks)

(d)   State whether $x = 2$ is the discontinuity point for:

$$f(x) = \begin{cases} x^2 + 1 & \text{if } x > 2 \\ 8x & \text{if } x < 2 \end{cases}$$

and show that $\lim\limits_{x \to 2} f(x)$ does not exists.

(6 marks)

(e)   Is $x = 0$ discontinuity point for:

$$f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ -1 & \text{if } x < 0 \end{cases}$$

(4 marks)

(f)   Find the limits of $\lim\limits_{x \to 4} \dfrac{x^2 - 9x + 20}{x^2 - 3x - 4}$

(3 marks)

Continued...

QUESTION 2 (25 MARKS)

(a) Consider the following system of equations:

$$\begin{cases} x + 2y = 5 \\ 3x + 7y = 18 \end{cases}$$

Solve the above system using an inversion of matrix method.

(5 marks)

(b) Given the technology matrix, A and the final demand vector, D as below:

$$\begin{array}{ccc} \text{Grain} & \text{Fertilizer} & \text{Cattle} \end{array}$$

$$A = \begin{bmatrix} 0.05 & 0.25 & 0.34 \\ 0.33 & 0.10 & 0.12 \\ 0.19 & 0.38 & 0 \end{bmatrix} \qquad D = \begin{bmatrix} 1800 \\ 200 \\ 900 \end{bmatrix} \begin{array}{l} \text{Grain} \\ \text{Fertilizer} \\ \text{Cattle} \end{array}$$

Determine the total demand, X for industries Grain, Fertilizer and Cattle. Apply $X = (I - A)^{-1} D$ formula and leave your answer in two decimal points.

(20 marks)

QUESTION 3 (25 MARKS)

(a) Find $\dfrac{dy}{dx}$ for $3x^2 - xy + 3y = 7$ using implicit differentiation.

(7 marks)

(b) Differentiate $y = x^x$.

(4 marks)

(c) Solve $\dfrac{dy}{dx}$ if $x = 2t - \dfrac{1}{t}$ and $y = t + \dfrac{4}{t}$ where $t \neq 0$.

(6 marks)

Continued...

(d)   Suppose the quantity demanded, q and the unit price, p for a certain commodity are related by the linear equation:

$$q = 240 - 2p$$

     i.   express the elasticity of demand as a function of p.

(2 marks)

     ii.   Is the demand elastic or inelastic at $p = 100$?

(3 marks)

     iii.   State whether the demand elastic or inelastic at $p = 50$.

(3 marks)

QUESTION 4 (25 MARKS)

(a)   Solve $\int e^{-3x+5} dx$

(4 marks)

(b)   Evaluate $\int_{0}^{1} xe^{-x} dx$

(6 marks)

(c)   If $f(x,y) = (2x^2 y + 3xy^2)e^{5xy}$, compute $f_x(1,1)$ and $f_y(1,1)$. Provide your answers in two decimal points.

(8 marks)

(d)   The demand equation for a product is:

$$q = 10(100 - p)^2$$

where q is unit price in Ringgit Malaysia and p is the quantity demanded, calculate consumers' surplus under equilibrium which occurs at a price MYR 84.

(7 marks)

End of Page.

Formula

1. Input-Output Model

$(I - A)\,X = D$

where A is the input-output matrix, D is the external or final demand and X is the production level.

2.Total differential (change)

If $z = f(x, y)$, then the total change is $dz = f_x dx + f_y dy$

3.Implicit function rule

For a function $f(x_1, x_2, ..., x_n, y), \dfrac{dy}{dx_i} = -\dfrac{f_{x_i}}{fy}$

4.Elasticity of demand

$\varepsilon_d = -\dfrac{dq}{dp}\Big|_{(q,p)} \cdot \dfrac{p}{q}$

5.Consumers' Surplus (CS) and Producers' Surplus (PS)

$$CS = \int_{\bar{p}}^{p_0} D(p)\,dp$$

$$PS = \overline{px} - \int_{0}^{\bar{x}} S(x)\,dx$$

where $\bar{p}$ is the unit market price, $\bar{x}$ is the quantity sold, D is the demand function and S is the supply function.